Report on Personal Data Assistant (PDA) applications relating to Glenn Research Center's Pollution Prevention (P2) Program
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The mission of the Pollution Prevention Team (P2) at the NASA Glenn Research Center (consistent with the facility Environmental Policy) is to:

1. **Identify sources and processes of pollution**
2. **To formulate suggestions and procedures to the Environmental Pollution Control Board for implementation**.

Pursuant to these mandates, the following opportunities were identified:

- Reduce the release and use of toxic and extremely hazardous chemicals. (Executive orders 12856 & 13101)
- Increase the effectiveness compliance reporting. (Including TRI reporting and EPCRA reporting.)
- Re-examine and revise the current GRC Chemical Exchange Program – which permits unused chemicals to be transferred to researchers who will use them, rather than simply excising them.

Since these opportunities are connected to the Chemical Management Program, (specifically the Chemical Inventory Program), a review and revision of the existing Chemical Management System (CMS) was undertaken by the Chemical Management Team. The Chemical Management Team (CMT) goals were:

- To establish true "Cradle to Grave" systems management;
- To improve chemical inventory accuracy;
- To minimize paper forms; and
- To reduce man-hours spent in the laborious inventory reconciliation process.

Integral to the system revision and to ensure the accuracy and validity of the system was an upgrade of the chemical inventory (audit) process. Historically, the audit process involved hand-scanning barcodes on containers using laser PDT's (Personal Data Transmitters) and uploading the information into the CMS Database. There the fields would "merge" and match containers scanned with database entries. Barcodes not recognized would be individually hand-entered into the CMS Database by the same technician, a laborious and time consuming process.
To improve the accuracy of the inventory process, the following modifications were implemented:

1. Acquire improved technology – Personal Data Assistants (PDA's) with a barcode scanning capability and increased memory storage.
2. Modify (simplify) PDA data entry fields.
3. Increase the frequency of audits by having personnel in each building perform their own inventories using pre-programmed, user friendly PDA's.

After the decision was made in early 2002 to replace the Personal Data Transmitters (PDT's) with upgraded technology, a study was done to investigate alternative technologies as opposed to simply purchasing upgraded PDT units. Development issues of primary concern were in the areas of safety, user acceptance and available software and software support. The scanning units would need to be safe for use in Class I, Division II, Groups A, B, C, and D environments. Users (primarily building residents) would need to be familiar with an existing technology with a

minimum amount of training. Software should be capable of modification to satisfy new program needs and directives, and software support should be cost-effective and readily available.

Based on these criteria, it was decided to explore the use of Personal Data Assistants (PDA's) with attached or built-in barcode scanners. In October of 2002, after a meeting with S. Peter Tschen (Branch Chief, Division 7790), it was decided to utilize Building 50 as the Alpha Test for the PDA Project, based on the quantity and variety of chemicals present used in manufacturing and research. CMT also suggested that Waste Management be contacted for assistance in excising "expired" or unused chemicals. A "hand inventory" was conducted of Building 50 to ensure a valid inventory and the data entered in the CMT Database. The building inventory was then scanned with the PDA units. Freshly reconciled data was then transferred to the existing Chemical Management System (CMS) database. Records of the previous inventory of Building 50 (2000) indicate 943 chemical containers were scanned in 25 man-hours. During the PDA Pilot Program, 845 chemical containers were scanned in 15 hours, 50 minutes.

In addition to inventory management within each building, the need to improve the accuracy and efficiency of the receipt and disposal of chemicals was also identified. Based on a review of current systems, PDA technology for chemical receipts will be a minor adjustment for the user, but an added efficiency in the upload process. This streamlines the "Cradle" side of chemical inventory management.

Even more critical is the ability of the Waste Management Team (WMT) to "expire" containers of chemicals being discarded. The WMT represents the "Grave" side of the inventory. Without being able to "expire" chemical containers, the inventory would merely continue to grow and rapidly become irrelevant for regulatory reporting. The current WMT process, due to safety concerns, was for a WMT technician to hand-write all the barcodes of the containers scheduled for disposal. This handwritten list would then be typed into a Word document to be forwarded to the CMT. CMT would then hand enter each item into the CMS. This process is extremely labor intensive and lends itself to three opportunities for transcription error. The results of an initial test using PDAs resulted in 200 chemicals being scanned within 2 hours. This data was sent to CMT in EXCEL format. The CMS was then updated by transferring the data into the SYBASE format database. Overall, a savings of 14 hours per week was realized. This represents a potential savings of 700 hours over the course of a year.

In summary, the utilization of PDA applications in facilitation of the "Cradle to Grave" Chemical Management System will support the following benefits:

- Streamlining inventory reconciliation which will lead to cost effective purchasing decisions;
- Will increase savings in man-hours (during the actual inventory process and in the addition of new chemical records);
  - -Inventory reconciliation – 1,000 hours/year
  - -New chemical records – 500 hours/year
  - -Expiration of discarded chemicals – 700 hours/year
- Permit other organizations (Industrial Hygiene, First Responders, Pollution Prevention Team) to save time and money by accessing a real-time CMS database for information pertinent to their needs.